No 2017-16 – September

Working Paper

CEPII

Banks Defy Gravity in Tax Havens

Vincent Bouvatier, Gunther Capelle-Blancard & Anne-Laure Delatte

Highlights

- Tax havens generate a threefold extra presence of foreign banks.
- The favorite destinations of tax evasion intermediated by European banks are Luxembourg and Monaco.
- British and German banks display the most aggressive strategies in tax havens.
- New transparency requirements imposed in 2015 have not changed European banks commercial presence in tax havens.
- Banks intermediate Euros 550 billion of offshore deposits, that is 5% of their origin countries' GDP.

Abstract

This paper provides the first quantitative assessment of the contribution of global banks in intermediating tax evasion. Applying gravity equations on a unique regulatory dataset based on comprehensive individual country-by-country reporting from all the Systemically Important Banks the European Union, we find that: 1) Tax havens generate a threefold extra presence of foreign banks; 2) The favorite destinations of tax evasion intermediated by European banks are Luxembourg and Monaco 3) British and German banks display the most aggressive strategies in tax havens; 4) New transparency requirements imposed in 2015 have not changed European banks commercial presence in tax havens; 5) Banks intermediate EUROS 550 billion of offshore deposits, that is 5% of their origin countries' GDP.

Keywords

Tax Evasion, International Banking, Tax Havens, Country-by-Country Reporting.

JEL

F23, G21, H22, H32.

Working Paper

CEPII

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CEPII Working Paper
Contributing to research in international economics

Editorial Director:
Sébastien Jean

Production:
Laure Boivin

No ISSN: 1293-2574

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RESEARCH AND EXPERTISE ON THE WORLD ECONOMY

Banks Defy Gravity in Tax Havens *

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June 19, 2018

*The authors thank Jezabel Couppey-Soubeyran, Mathieu Crozet, Dhammika Dharmapala, Thierry Mayer, Tom Neubig, Franz Reiter, Bert Scholtens, Shyam Sunder, Farid Toubal, Michael Troege, Gabriel Zucman, and the participants of the 2017 National Tax Association Conference, Princeton University EU seminar, Columbia University (SIPA) seminar, CEPII, EU Policy Network, Groningen University, and University of Buenos Aires for helpful discussions. They thank Manon Aubry and Thomas Dauphin from Oxfam for sharing their database. They also gratefully acknowledge Mona Barake and Pranav Garg for excellent research assistance. This research has benefited from the support of Research fellowships 2016-2017 with reference 2016 ECFIN 013/B. The usual disclaimer applies.

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"*Increased transparency regarding the activities of institutions, and in particular regarding profits made, taxes paid and subsidies received, is essential for regaining the trust of citizens of the Union in the financial sector. Mandatory reporting in that area can therefore be seen as an important element of the corporate responsibility of institutions towards stakeholders and society.* – Recital (52) to CRD IV.

1 Introduction

In 2008, a former UBS employee, Bradley Birkenfeld, arrested in the United States, revealed detailed information according to which UBS maintained Swiss accounts for thousands of U.S. clients with billions of dollars in assets not disclosed to U.S. tax authorities (Levin and Coleman, 2008). In 2003, a US Senate report noted that major banks provided purported loans for tens of millions of dollars essential to the transactions composing potentially abusive or illegal tax products sold by KPMG to individuals or corporations to help them reduce or eliminate their U.S. taxes (US Senate, 2003). In sum, there are considerable anecdotal evidence that global banks are a key link of a complex tax evasion chain (Shaxson, 2018).

This paper is the first one to provide a systematic quantitative assessment of global banks' role in facilitating tax evasion for their customers. We dissect new regulatory country-by-country data on individual banks foreign activity and we assess that global banks intermediate €550 billion of offshore deposits. We then document offshore banking geography and discuss policy implications. Our work contributes to better quantifying offshore wealth and helps designing a functioning policy agenda.

Since 1 January 2015, according to the Capital Requirements Directive IV of the EU (Article 89), all Member States banks with a consolidated turnover above €750 million are required to publicly disclose the activity of all their affiliates (subsidiaries and branches) regarding the allocation of their income, profit and taxes. We hand-collect information on employment and bank turnover for all Global- and Local-Systemically Important Banks (SIBs) in the EU from these country-by-country reports (CbCR). It represents 37 banks for 2015 and 2016, the first years the data were available. Preliminary descriptive statistics reveal that banks headquarters are located in 10 EU countries; their foreign affiliates are located in 138 countries in total, including about thirty tax

havens jurisdictions (depending on the list we consider). Tax havens represent 1% of the total sample's population, 2% in terms of GDP, while EU banks record 18% of their foreign turnover and 29% of their foreign profit in these countries. Such striking statistics motivate our empirical investigation. It is fair to note that not every euros cashed out in tax havens is artificially generated. Some tax havens are also large financial hub meaning that standard factors drive a part of the activity (think of Luxembourg). Therefore, a rigorous assessment of the specific role of banks in intermediating tax evasion needs to disentangle "natural" from artificial business motivated by tax evasion.

We use a standard gravity model applied to financial transactions to disentangle natural from tax evasion intermediating activity. We use the well-documented result that bilateral transactions rise proportionately with the economic size of both countries ("mass") and are negatively correlated with frictions ("resistance") to quantify the amount of foreign affiliates activity predicted by standard factors (Portes et al. (2001), Portes and Rey (2005), Martin and Rey (2004) and Okawa and van Wincoop (2012)). We extend the sample from 138 countries where banks report a foreign affiliate to 228 countries to account for the absence of activity in a country, an insightful information. We employ the Poisson pseudo maximum likelihood (PPML) estimator. It is standardly used to estimate gravity models in presence of zeros in the dependent variable vector and also presents the other advantage of consistent estimated coefficients (Santos Silva and Tenreyro (2006)). We then use this estimated model to assess the abnormal activity of banks in tax havens, i.e. the level of activity not predicted by the model.

We find that banks activity in tax havens is three times larger than model's predictions on average. However there is a large heterogeneity among tax havens: in most havens, abnormal banking activity is negligible (in terms of recipient country GDP); a few havens concentrate the bulk of banking activity: Channel Islands are an important hub for evasion intermediated by British banks for historical reasons. Then, Luxembourg and Monaco stand out with banks' abnormal activity representing 9% and 8.5% of GDP respectively according to our estimates. There is also a strong heterogeneity in the nationality of tax havens banks: German and British banks display the most aggressive strategies in tax havens with an aggregate abnormal activity representing 7.3% and 10% of their global activity. In comparison, in the other banks, abnormal activity in havens represents 1.7% of their activity on average. We then show that CbCR requirements has not changed

banks commercial presence in tax havens after it was introduced. In additional computations, we estimate that the banks in our sample intermediate a total of €549.2 billion offshore deposits, i.e. 4.8% of their domestic countries' GDP. Again, British banks stand out with offshore deposits intermediated by them estimated at 13.8% of the UK GDP.

The role played by banks in tax evasion has rarely been assessed and our paper contributes to filling the gap.[1] Alworth and Andresen (1992) provided early evidence based on aggregated bilateral deposit flows from the BIS that tax differential between countries and bank secrecy are key determinants of international banking deposits. Huizinga and Nicodème (2004) provided further evidence showing that a part of international deposits is intended to facilitate tax evasion. Using BIS bilateral deposit data, they show that international depositing is driven by interest income taxation and income reporting practices. Johannesen (2014) examined how household tax evaders reacted to the 2005 EU Saving Directive and showed that a fraction of offshore wealth was undeclared and that tax evaders were highly responsive to policy measures.[2] Johannesen and Zucman (2014) confirmed the responsiveness of bank deposits to anti-tax evasion measures by showing that deposits shifted from havens that adopted bilateral information exchange treaties to havens that did dot. Our contribution to this branch of the literature is to quantify the effect of being a tax haven on the commercial presence of foreign banks. CbCR data have the advantage of offering exhaustive information on the destination countries contrary to the BIS data, which exclude important tax havens, such as Channel islands and Monaco. And, in fact, we find that these havens play an important role in Europe. Our second contribution is on offshore geography, a somehow recent question in the tax havens literature. CbCR reporting data directly provide bilateral information by destination and by origin countries. So far, previous works drawing on bilateral data could only observe one origin country (e.g., Zucman (2013) observes who owns Swiss accounts through data of the Swiss National Bank, Chernykh and Mityakov (2017) use mandatory Russian banks reports to the Central Bank), or one destination country (e.g., Weyzig (2013) observes micro-data from Dutch conduit entities). In contrast CbCR data offer a multi-country perspective. Some recent

[1] There is very little academic research on tax havens: this topic accounts for less than 0.4% of the academic literature on taxation (see more details in the additional appendix). The reason is mainly related to the scarcity of data on tax havens. Stimulating academic surveys on international tax competition, profit shifting by multinational enterprises (MNEs), and tax havens are provided by Hines (1999), Devereux (2007), Hines (2007), Hines (2010), Dharmapala (2008), Dharmapala (2014), and Zucman (2015).

[2] The Directive introduced withholding tax on interest income of EU-resident holders of bank deposits in cooperative tax havens.

works have attempted to give a multi-country perspective despite the absence of bilateral data. Alstadsæter et al. (2017) document the geographic origin of offshore private wealth while Tørsløv et al. (2017) and Bennedsen and Zeume (2018) focus on the origin of corporate evasion. The two first papers draw on aggregate estimates of offshore money established by Zucman (2013) and design original apportionment keys to assign the aggregate amount to origin countries.[3] In contrast, CbCR data provide a straightforward window to bilateral information, a fact that allows us to point to important heterogeneity among countries of origin.

Last, we also contribute to the literature on the determinants of international activity of commercial banks (Buch (2003), Papaioannou (2009), Bouvatier and Delatte (2015)). More particularly, papers examining tax determinants in banking business have so far focused on proprietary profit shifting (Merz and Overesch (2016), Demirgüç-Kunt and Huizinga (2001)). Relative to this literature, we focus on banks commercial presence motivated by intermediating tax evasion for their clients rather than by proprietary profit shifting.

The rest of the paper is organized as follows. Section 2 presents our new hand-collected dataset and some descriptive statistics, Section 3 describes our empirical strategy, Section 4 reports the empirical results of our gravity model, Section 5 use the gravity results to analyze the geography of offshore banking, Section 6 draws policy implications and Section 7 concludes. We present methodological details and additional results in Appendix.

2 Data and Stylized Facts

Country-by-country reporting (CbCR) requires the largest firms to provide detailed information regarding the allocation of their activity. From 2015, according to the Capital Requirements Directive IV (Article 89)[4] , all banks in the EU with a consolidated turnover above €750 million are required to publicly disclose the activity of all their affiliates (subsidiaries and branches) on a country-by-country basis for the following items: turnover (net banking income), number of employees (on

[3]Zucman (2013) draws on Swiss data and statistic anomalies in international investment stocks to estimate that 8% of the global financial wealth of households is held in tax havens and 6% goes unrecorded. Alstadsæter et al. (2017) uses the country share of banking deposit as recorded by the BIS while Tørsløv et al. (2017) calculates countries shares of imports of high-risk service and assigns the aggregate estimates of corporate profit shifting by origin country along these shares.

[4]This directive has followed the French initiative, adopted in 2013 as part of the *Loi de séparation des activités bancaires*.

a full time equivalent basis), profit or loss before tax, tax on profit or loss, and public subsidies received.[5]

We collect the data for all Global- and Domestic-Systemically Important Banks (SIBs) in the EU, i.e. 37 banks for 2015 and 2016, the first years the data were available.[6] All these banks are large, with a leverage ratio exposure measure above €200 billion. The 37 banks are located in 10 EU countries: Austria (1), Belgium (1), Denmark (1) France (6), Germany (7), Italy (3), Netherlands (3), Spain (5), Sweden (4), and the United Kingdom (6). In the following of the paper, we use 2015 data, except otherwise specified (the results for 2016 are discussed in Section 5).

Tables A and B report the descriptive statistics at the group level. The 37 banks employ 1.2 million people and record a total of EUR 278 billion abroad in 138 partner countries (out of 2.3 million people and EUR 576 billion total turnover). Banks have foreign affiliates in 1 to 79 countries. On average, each bank reports activity in 24 partner countries with large heterogeneity: Banque Postale and Nationwide report activity in 1 and 3 partner countries respectively while BNPP and Société Générale declare activity in 64 and 79 different partner countries. Banks on average report a foreign turnover and employment representing 48% and 53% of the total. Some banks record a larger turnover abroad than in their own country (e.g., BBVA in Mexico, Santander in Brazil). HSBC and Santander record the largest foreign presence of the sample and Banque Postale and Helaba the smallest. The total number of foreign commercial presences reported in the CbCRs by the 37 banks is 902.

What does their commercial presence in tax havens look like? The 37 banks of our sample are located in 26 tax havens included in the list initially established by Hines and Rice (1994) and updated by Dharmapala and Hines (2009).[7] Not surprisingly given the European perspective of our sample, banks display a significant commercial presence in European tax havens: 27 banks have affiliates in Luxembourg (as much as in the UK), 13 in Jersey (as much as in Norway), 10 in Monaco, 9 in Guernsey and 7 in Isle of Man.[8] Some banks in the sample also report commercial

[5]The information from the CbCR 2015 has been operated first by the NGO Oxfam which has kindly shared their database with us. We extended their 2015 data from 20 to 37 banks.

[6]There are 38 G-SIB and D-SIB in the EU and 37 have an international activity (the exception is the Danish bank Nykredit).

[7]The list of countries is provided in Appendix.

[8]Some of the British banks have different reporting standards regarding Jersey and Guernsey (together referred to as "the Channel Islands") and Isle of Man (HSBC, Lloyds and RBS). Some report on the Channel Islands as one jurisdiction. Others also include the Isle of Man in this small group. This limits the way in which this research can

presence in American tax havens, i.e. the Bahamas, Bermuda, the Cayman Islands and Panama, although to a much lesser extent. Unexpectedly, banks report no commercial presence in Samoa, St Kitts & Nevis, or Barbados although they are registered in more than 8 lists.

Table 1 displays the turnover, number of employees, profits and tax on profits of foreign affiliates reported by the EU banks included in our sample. The activity is broken down into non tax havens/ small and big tax havens. EU Banks report €48.5 billion turnover in tax havens which account for 17.4% of their foreign turnover and they employ 104,202 people, i.e. 9% of their workforce abroad. It implies a turnover by employee of €465,864, i.e. almost twice larger than the ratio in non-tax haven countries, €206,035. Yet, aggregated efficiency indicators suggest that banks in tax havens are not more efficient than banks located in non-tax havens. In fact, World Bank data indicate that the bank costs to income ratio is similar in tax haven and non-tax haven countries (the mean is 58.5 and 58.9 resp.).[9] In any case, tax havens represent less than 2% of the world GDP (Table C), 4.7% of EU banks total workforce (foreign and domestic), 8.4% of their total turnover and 19.0% of their total profit. These stylized facts suggest a disproportionate presence of banks in tax havens. In the following, we use a gravity model to estimate the theoretical activity of foreign affiliates.

Last but not least, reporting banks may be tempted to inflate their turnover in low tax jurisdiction to be consistent with reported profit. In a general MNE context, Clausing (2003) finds that sales are more sensitive to tax-motivated financial manipulation than is the number of employees.[10] In order to account for potential manipulation, we run estimates on both activity variables, i.e. turnover and number of employees. The two different estimates can be considered as lower and upper band estimates.

draw conclusions regarding Jersey, Guernsey and the Isle of Man as three separate jurisdictions. In order to minimize these limitations and avoid double counting for these three islands, we input the average by jurisdiction.

[9] An alternative measure is bank overhead costs to total assets equal to 2.4 and 1.7 on average in tax haven and non-tax haven countries respectively. We collect data from the Global Financial Development database of the World Bank. We calculate the 2010-2015 mean for each country and take the average of tax haven countries and of high income non-tax haven countries (tax havens are high income economies with an average GDP per capita US$ 37,000 US). Data are available for 37 out of 41 countries included in Hines and Rice (1994) list (countries not included are Anguilla, British Virgin Islands, Montserrat, Sint Maarten, and Saint Martin). Source: GFDD world bank database

[10] She shows a disconnection between reported sales and employment in US MNE. While sales concentrates in small and low tax countries, high employment locations are large economies with similar effective tax rate as US. 1 percentage-point reduction in the tax rate difference variable would increase employment by 1.6 percent, sales by 2.9 percent, assets by 4.8 percent, and gross income by 5.2 percent.

Table 1: Bank activities in foreign countries

	Non havens (112)	Small havens (19)	Big havens (7)	Tax havens (26)	Total Foreign (138)
Turnover	229,959	13,585	34,959	48,544	278,503
In % of foreign	83%	5%	13%	17%	100%
Employees	1,116,115	22,649	81,553	104,202	1,220,317
In % of foreign	91%	2%	7%	9%	100%
Profits	54,126	7,599	14,492	22,090	76,216
In % of foreign	71%	10%	19%	29%	100%
Tax on profits	15,016	827	1,695	2,521	17,538
In % of foreign	86%	5%	10%	14%	100%
Turnover/GDP	0.2%	4.9%	1.9%	2.2%	0.3%
Turnover/Employees	21%	61%	43%	47%	23%
Profit/Turnover	24%	55%	41%	45%	27%
Profit/Employees	5%	34%	18%	21%	6%
Tax/Profit	28%	11%	12%	11%	23%

Note: Source : CbCR (2015). Sample : The 37 largest European banks. The sample includes only countries where European banks declare affiliates. Figures are in €billion, except number of employees and ratios.

3 Specify the Banks Foreign Commercial Presence

3.1 Gravity Assessment

Following the modeling of trade flows in Santos Silva and Tenreyro (2006), we consider an exponential specification of a gravity model on banks' foreign commercial presence and we use the Poisson pseudo-maximum-likelihood (PPML) estimator to estimate the model:[11]

$$\begin{aligned} Y_{k,i,j} = \exp(&\alpha_k + \beta_1 \log(GDPCAP_j) + \beta_2 \log(Pop_j) + \beta_3 Eur_{i,j} + \beta_4 \log(dist_{i,j}) + \beta_5 \log(dist_{i,j})^2 \\ &+\beta_6 Contig_{i,j} + \beta_7 Lang_{i,j} + \beta_8 Colony_{i,j} + \beta_9 RTA_{i,j} + \beta_{10} Territory_{i,j} + \beta_{11} GFC_j^{Dum} \\ &+\beta_{12} GFC_j^{Rating}) + \varepsilon_{k,i,j} \end{aligned} \quad (1)$$

[11]The advantages of the PPML estimator are presented in the Estimator Appendix. For robustness check, we also consider the Negative Binomial Quasi-Generalised Pseudo-Maximum Likelihood estimator (NB QGPML) as suggested by Bosquet and Boulhol (2014). Results are presented in the Robustness Section in Appendix

where $Y_{k,i,j}$ is the turnover or the number of employees, the subscripts refer to the foreign commercial presence of bank k (with headquarter in country i) in destination country j.[12] We choose to include a bank fixed effect (α_k) to control for unobserved heterogeneity at the bank level. Consequently, parameters associated with gravity variables at the country i level cannot be identified, and are excluded from the specification. The GDP per capita ($GDPCAP_j$) and the population in country j (Pop_j) are used as economic mass variables in the gravity specification (sources and computation details are described in Appendix). The standard gravity variables also include a set of bilateral variables at the country level: the geographical distance ($dist_{i,j}$) and dummy variables indicating the presence of a common border ($Contig_{i,j}$), a common language ($Lang_{i,j}$), a colonial relationship ($Colony_{i,j}$), the signature of a regional trade agreement ($RTA_{i,j}$), the fact that both countries are a member of the euro area, ($Eur_{i,j}$) and whether the partner country (j) is a dependent territory of country i ($Territory_{i,j}$). In the gravity specification, the distance is considered to be the main friction so β_4 is expected to be negative. However, the effect of distance can be overestimated for neighboring countries implying a positive sign expected for the estimated coefficient β_6. Similarly, the variables $Lang_{i,j}$, $Colony_{i,j}$, $Territory_{i,j}$, $RTA_{i,j}$ and $Eur_{i,j}$ are expected to positively affect the commercial presence. We then adjust the standard gravity specification to account for the specificity of our data. First we account for nonlinear financial transaction costs with the square of the distance $dist^2_{i,j}$. Second, GFC_j^{Dum} and GFC_j^{Rating} account for agglomeration economies due to financial infrastructures.[13] We distinguish primary off shore centers (OFC) such as London or New York acting as international financial intermediaries from secondary OFC such as the Cayman Islands, the Bahamas, Panama which are booking, collecting and funding centers. To do so, GFC_j^{Dum} takes a value of one if country j has a financial center classified as global in the Global Financial Center Index (see Appendix for source and details). GFC_j^{Rating} normalizes the GFCI ratings to range between 0 and 1 to account for the differences of agglomeration economies among Global Financial

[12]The variable $Y_{k,i,j}$ is equal to 0 for destination countries not reported in the CbCR. Furthermore, few negative, nul or missing values can be reported in the CbCR. These observations are set to 1 to differentiate between foreign countries in or out of the CbCR. This data treatment does not alter the empirical results.

[13]There is a usual confusion between tax havens and offshore financial centers, i.e. financial places providing financial services to non-residents (OFC). For example, Switzerland is considered a tax haven (3 lists) and is ranked as 7th largest financial center ranked by banks' external assets. A lot of tax havens are indeed large OFC, by nature. However not all tax havens are OFC: for example Lebanon appears on 5 lists of tax havens but is not in the top 50 financial centers. In turn, some major OFC are not tax havens: United Kingdom is not on any list of tax haven and is ranked first largest financial center. Therefore not controlling for OFC would overestimate tax havens effect.

Centers (for instance, New York and London have higher ratings than Paris). The 37 banks are present in 138 countries in total. The lack of presence in a jurisdiction is an important information that we want to account for. To do so, we extend the sample to include 228 destination countries by completing the dependent variable with zeros and we collect the corresponding gravity variables for all the remaining countries. In total, we run our estimate on a large sample including 228 destination countries. As a robustness test, we report the estimated results on the small sample on 138 partners.

3.2 Tax Haven Effect

We include TH_j^{Hines} a dummy variable indicating if country j is listed as a tax haven by Hines and Rice (1994):

$$\begin{aligned} Y_{k,i,j} &= \exp(\alpha_k + \beta_1 \log(GDPCAP_j) + \beta_2 \log(Pop_j) + \beta_3 Eur_{i,j} + \beta_4 \log(dist_{i,j}) + \beta_5 \log(dist_{i,j})^2 \\ &\quad + \beta_6 Contig_{i,j} + \beta_7 Lang_{i,j} + \beta_8 Colony_{i,j} + \beta_9 RTA_{i,j} + \beta_{10} Territory_{i,j} + \beta_{11} GFC_j^{Dum} \\ &\quad + \beta_{12} GFC_j^{Rating} + \beta_{13} TH_j^{Hines}) + \varepsilon_{k,i,j} \end{aligned} \quad (2)$$

We test two alternative specifications for robustness: TH_j^{Count} a count variable equal to the number of tax havens lists on which country j is recorded; TH_j^{Top15} a dummy variable equal to 1 if country j is ranked in the top 15 of tax havens defined by Oxfam and 0 otherwise.

3.3 Abnormal Activity

We define on the "abnormal activity of banks as the difference between the foreign activity predicted by the gravity factors and the actual values. We use Eq. (1) to get the "theoretical" or "normal" level of activity and we keep the residuals to get the unexplained amount of activity. Then, we aggregate these residuals to get a proxy of abnormal turnover at the bank k, the country i or the

country j level. More precisely, we calculate three indicators of relative abnormal turnover:

$$\text{for a given destination country } j = J,\ AbY_J = \frac{\sum_k \hat{\varepsilon}_{k,i,J}}{GDP_J}\ ; \tag{3}$$

$$\text{for a given bank } k = K,\ AbY_K = \frac{\sum_j \hat{\varepsilon}_{K,i,j}}{TotY_K}\ ; \tag{4}$$

$$\text{for a given origin country } i = I,\ AbY_I = \frac{\sum_k \sum_j \hat{\varepsilon}_{k,I,j}}{TotY_I}, \tag{5}$$

where $\widehat{\varepsilon}_{k,i,j}$ are the residuals of Eq. (1), i.e., the unexplained turnover of bank k in country j[14], $TotY_K$ is total activity (domestic plus foreign) of bank K and $TotY_I$ is total activity (domestic plus foreign) of banks belonging to country I. In Eq. (1), we collapse the residuals by destination country j and we normalize the sum by the country's GDP to draw cross-country comparison. In Eq. (2), we collapse the residuals by bank k and we normalize by the total turnover (domestic plus foreign). In Eq. (3), we collapse the residuals by origin country i and we normalize the sum by the total turnover (domestic plus foreign) of all banks in the sample with headquarter in country i.

4 Emprical Results based on Gravity Equations

4.1 Standard Gravity Effects

First, we examine the estimates of Eq. (1) to check whether gravity factors have a consistent effect (see Table 2, columns 1 and 3). Most gravity variables are significant and estimated coefficients display the expected sign. The larger the size of country j, the larger the commercial presence of foreign affiliates. Distance significantly affects the commercial presence of foreign affiliates. The parameter associated with variatble $Dist_{i,j}$ has the expected negative sign, suggesting that distance captures frictions of doing business internationally. However, the square of the distance indicates that this relationship is non-linear. The quadratic specification suggests that the marginal distance effect is negative until a turning point is reached. Furthermore, the parameter associated with the common border dummy is not significant at the 10% level, suggesting that contiguity does not lead to an additionnal commercial presence. In addition, being a member of the euro area,

[14]We exclude observations for which turnover is zero in these computations.

a common langage and a former status of colony all positively affect the reported activity. As expected, a common regional trade agreement between countries i and j is also associated with larger commercial presence. Last, the effects of agglomeration economies are significant, with a larger effect on turnover than on employment, and suggest that only the top-ranked GFC attract more commercial presence of foreign banks.[15] In total, the commercial presence of European banks affiliates abroad is accounted for by standard gravity factors. Now we explore the differences between tax haven and non-tax haven economies.[16]

4.2 Tax Haven Effect

The inclusion of the variable of interest, TH_j in Eq. 2, precisely addresses this issue. Results are displayed in columns 2 and 4 in Table 2. Its effect is significant at the 1% level and the estimated coefficient is positive in both specifications including turnover and employment. Its inclusion does not change the effect of the gravity variables and only marginally the value of the estimated coefficients. The estimated coefficient of TH_j is 1.10 in the regression on turnover which corresponds to an additional turnover of 202% (i.e. a multiplication by 3). The estimated coefficient is 0.96 in the regression on employment, which corresponds to an additional employment of 161% (2.5). Last, all the robustness estimates including alternative definitions of tax havens yield positive and significant coefficient too (see Table E in Appendix).

In sum, we obtain consistent and robust evidence that, conditioned on gravity factors, tax havens attract extra commercial presence of multinational banks compared to non-tax haven countries. This first estimate informs us about the average magnitude of tax havens effect, i.e. a substantial threefold increase of foreign banks activity in tax havens. In the following, we will go beyond this average effect and document heterogeneity among countries. To do so, we proceed our empirical investigation on turnover only, given that both estimates on turnover and employees yield similar conclusions.

[15] The parameter associated with the dummy variable is negative while the parameter associated with the rating variable is positive (and higher in absolute value). Therefore the results suggest that the GFC with the higher ratings attract more commercial presence.

[16] We run various alternatives to check the robustness of our estimates. See Appendix.

Table 2: Baseline specifications (Large sample, PPML Estimator)

Dependent variable:	$Turnover_{k,i,j}$		$Turnover_{k,i,j}$		$Employees_{k,i,j}$		$Employees_{k,i,j}$	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$\log(GDPCAP_j)$	1.2402***	(0.1319)	1.2800***	(0.1375)	1.0230***	(0.1137)	1.0409***	(0.1191)
$\log(Pop_j)$	0.6219***	(0.0986)	0.7862***	(0.0811)	0.8866***	(0.0741)	0.9604***	(0.0577)
$\log(dist_{i,j})$	-4.6686***	(0.6576)	-5.2433***	(0.7624)	-4.1691***	(0.9544)	-4.7211***	(1.0270)
$\log(dist_{i,j})^2$	0.2843***	(0.0436)	0.3190***	(0.0505)	0.2403***	(0.0626)	0.2745***	(0.0675)
$Euro_{i,j}$	0.5881**	(0.2546)	0.7565***	(0.2646)	0.1381	(0.2748)	0.3123	(0.2888)
$Contig_{i,j}$	0.4269	(0.2747)	0.2347	(0.2715)	0.2838	(0.2681)	0.0828	(0.2788)
$Lang_{i,j}$	0.7047***	(0.2186)	0.6181***	(0.2225)	0.8855***	(0.2183)	0.7945***	(0.2149)
$Colony_{i,j}$	1.0936***	(0.2718)	1.1321***	(0.2596)	0.9790***	(0.2592)	1.0247***	(0.2501)
$RTA_{i,j}$	0.6905**	(0.2938)	0.7510**	(0.2974)	0.7156***	(0.2712)	0.7409***	(0.2768)
$Territory_{i,j}$	0.2345	(0.5364)	0.2197	(0.5036)	0.6177	(0.5354)	0.2087	(0.6110)
GFC_j^{Dum}	-1.1454***	(0.3140)	-1.5050***	(0.3541)	-1.5058***	(0.3563)	-1.7569***	(0.3805)
GFC_j^{Rating}	2.0620***	(0.5110)	2.0587***	(0.5407)	1.0203*	(0.5273)	1.1270**	(0.5516)
TH_j^{Hines}			1.1073***	(0.3591)			0.9619***	(0.3730)
No. Obs.	8399		8399		7491		7491	
No. Positive Obs.	902		902		873		873	
No. Countries	228		228		228		228	
No. Tax Havens	-		43		-		43	
Log Likelihood	-326297		-316969		-1651794		-1629547	
BIC	653037		634391		3303989		3259505	
R2	0.32		0.33		0.30		0.32	
pseudo-R2	0.69		0.70		0.63		0.64	

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Heteroskedasticity robust standard errors (using Huber/White/sandwich estimator of variance) are in brackets.

5 Some Unpleasant Geography

5.1 Which Countries Attract the Largest Unexplained Banking Activity?

Table 3 compares abnormal turnover for tax havens and non-tax havens. The mean value of AbY_j is 0.0058 (0.5% of GDP) on the full sample while the median value is 0.0012 (0.12%) implying right skewness in the data; it means that a few jurisdictions attract a substantial amount of extra-activity, i.e. activity beyond the standard model prediction. In fact, when we split our full sample into tax haven and non-tax haven countries, the mean is significantly higher in the first sample: abnormal activity represents 2.29% of GDP in tax havens and 0.18% in non-tax haven countries (the means

are significantly different at the 1% error, see Table 3). It confirms that a significant amount of foreign banks commercial activity goes unexplained in tax havens. Now, which countries attract the largest unexplained banking activity?

Table 3: Abnormal turnover: tax havens versus non-tax havens

	All countries	**Non tax havens**	**Tax havens**
Mean	0.0058	0.0018	0.0229
Median	0.0012	0.0008	0.0084
Mean test statistic	3.61		
$(p-value)$	(0.000)		
Median test statistic	1.42		
$(p-value)$	(0.159)		

Note: OLS and quantile regessions are used to implement the mean test and the median test respectively. The standard errors used to implement the mean test and the median test are robust to heteroskedasticity (using the Huber/sandwich estimator). The null hypotheses are no difference in mean/median of abnormal turnover values between tax havens and non tax haven countries. Data: CbCR (2015). Source: Authors.

To answer, Figure 1 plots the destination countries of our sample along three dimensions: in the x-axis, we report the number of banks of our sample reporting a commercial presence in country j, in the y-axis, we report the total abnormal turnover by banks in country j defined in Eq. (3); last the size of the circle is proportionate to the total turnover reported by banks in country j to get a sense of the individual country j contribution.[17] For the sake of readability, only the name of the tax havens are labelled on the figure.

Heterogeneity among tax havens is striking:

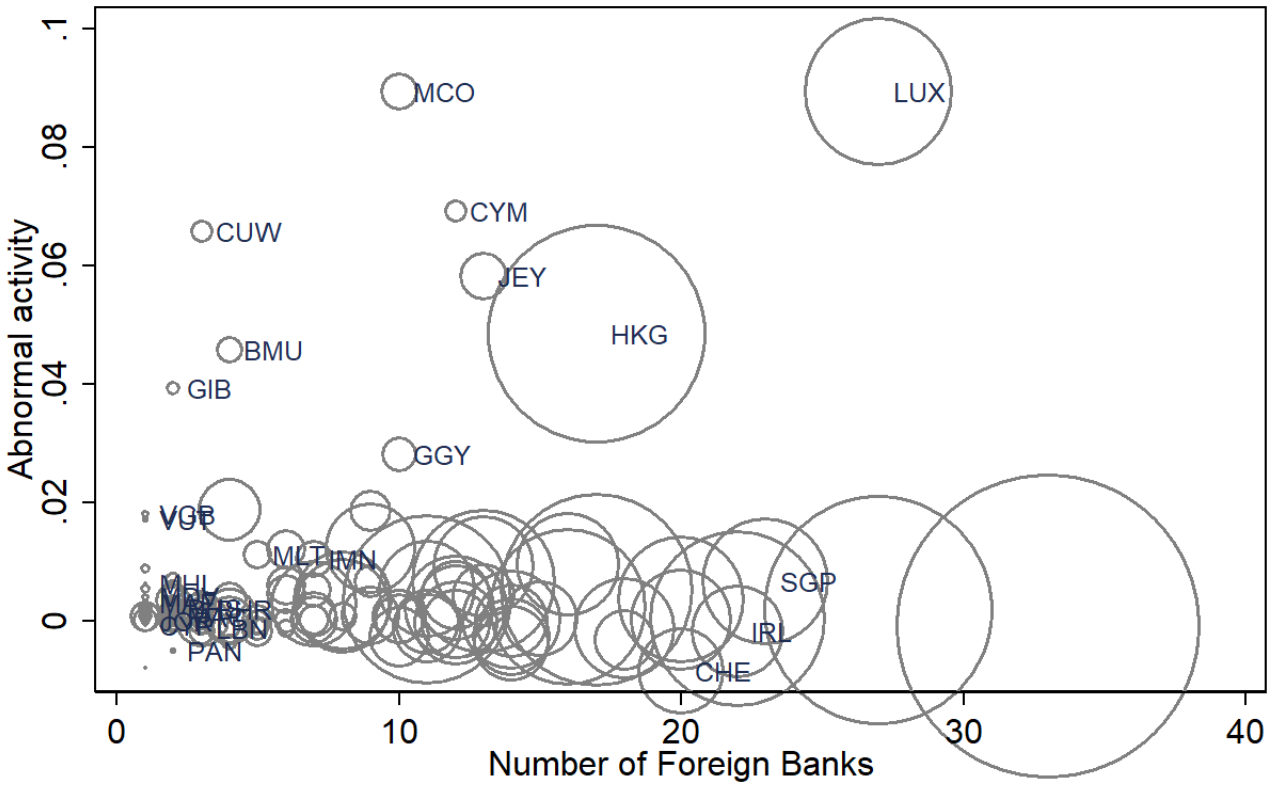
- Most of the tax havens (down-left in the figure) display a negligeable abnormal activity (in terms of GDP) and attract only few foreign banks.

- Some tax havens display a significant abnormal activity (included between 3% and 7% of their GDP) and differ according the concentration of foreign presence: for example abnormal activity in Curacao represents 6.5% of GDP recorded by three foreign banks. The Channel islands, Jersey and Guernsey host the commercial presence of 13 and 10 foreign banks respectively, mostly from the UK.[18] Hong Kong which displays a similar abnormal activity (4.8% of its

[17] Our sample is composed of the 138 countries where turnover is strictly positive.

[18] The Channel Islands were known as tax havens since the 1920s. At the origin, the Corporate Tax law implied a flat tax rate of 50 Pounds on companies registered on the islands but controlled from other locations within the British Empire, and an income tax if the company was controlled outside the Empire (Palan et al., 2013)

Figure 1: Abnormal banking activity by destination



Note: Y-axis: Abnormal activity is the sum of abnormal turnover recorded by destination country j in terms of GDP. X-axis: Number of banks k reporting foreign affiliates in destination country j. The size of the circle is proportionate to the total turnover recorded in destination country j. The reference list of tax havens is Hines and Rice (1994).

GDP) has the largest number of foreign banks in the group (17).

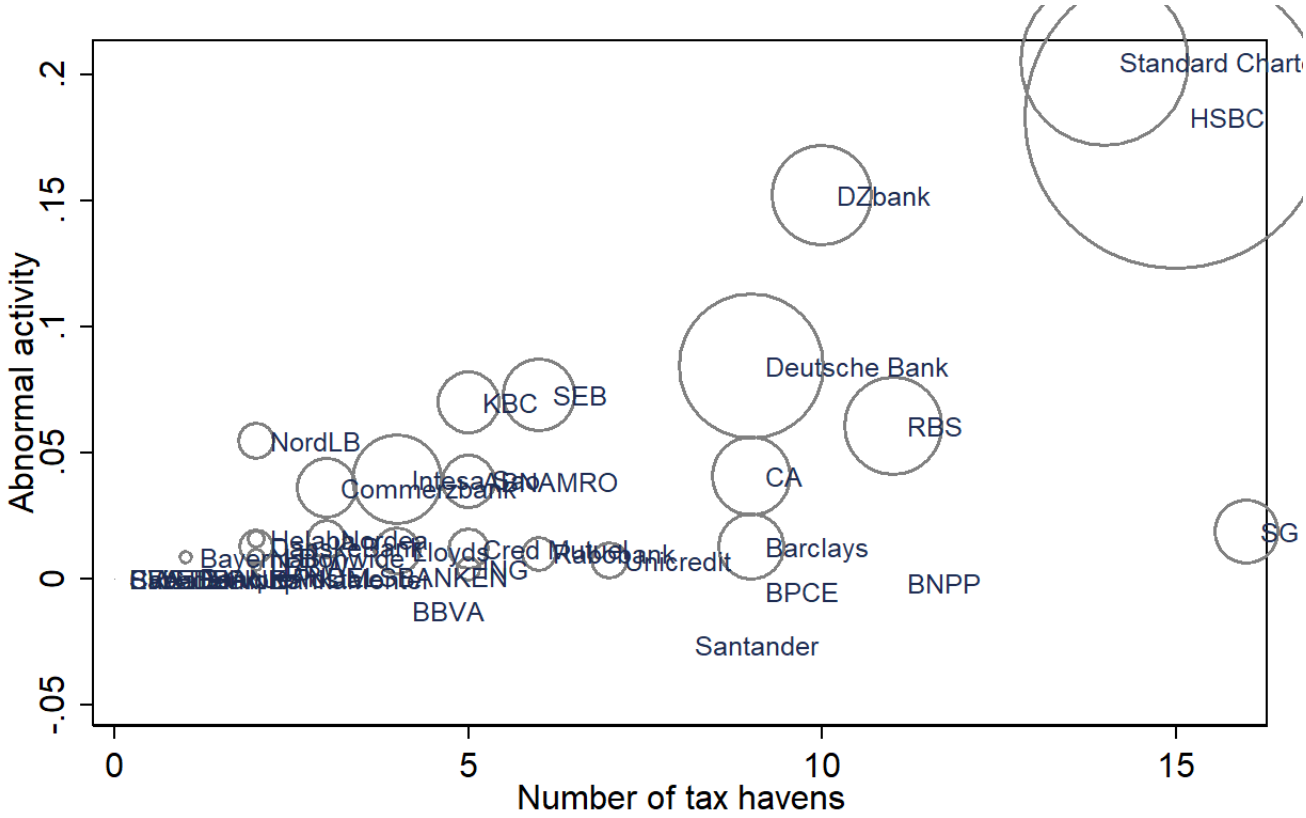
- In contrast, Singapore and Switzerland are global financial centers with a low abnormal activity (they form a third group with Ireland). Switzerland has a longstanding tax evasion tradition but a very low foreign penetration, which probably explains that it does not stand out on the graph.

- Last, Monaco and Luxembourg unambiguously stand out as the most aggressive tax havens for European banks: abnormal banking activity represent 8.5% and 9% of GDP respectively. Luxembourg is also the most attractive with 27 out of 37 banks of our sample reporting a foreign presence in Luxembourg.

In sum, the majority of tax havens display a low abnormal banking activity (in terms of GDP) and serves only few banks (rarely more than 2); a few havens are more aggressive and entertain specific bilateral relationships for historical reasons. In turn, Luxembourg and Monaco record a substantial abnormal activity. We discuss policy implications in Section 6.

5.2 Which Banks are the Most Active in Intermediating Tax Evasion?

Figure 2: Abnormal activity by banks

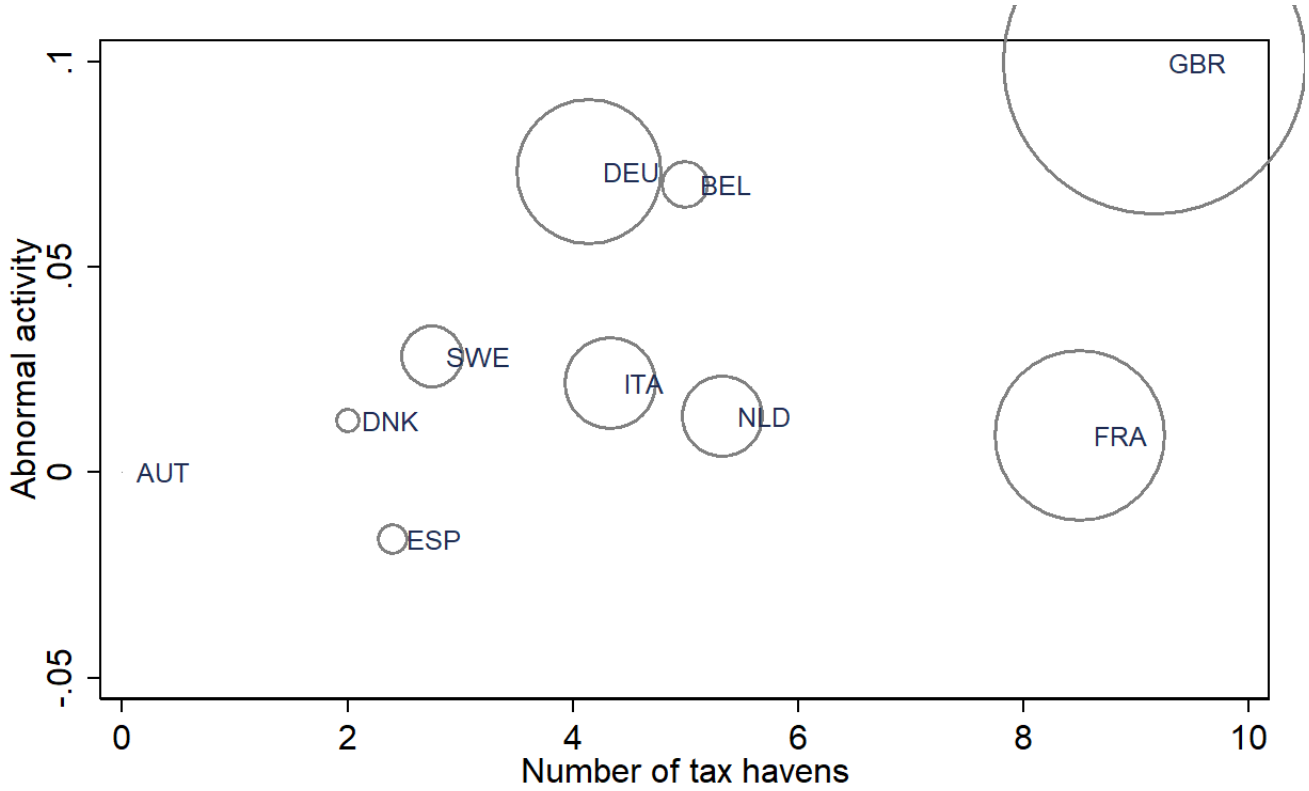


Note: Y-axis: Abnormal activity is the sum of abnormal turnover recorded by bank k in tax havens as a ratio of total turnover (domestic+foreign). X-axis: Number of tax haven jurisdictions where bank k reports foreign affiliates. The size of the circle is proportionate to the total abnormal turnover recorded by bank k in tax havens. The reference list of tax havens is Hines and Rice (1994).

Figures 2 and 3 provide information about the origin of abnormal turnover, at the bank- and the origin-country-levels, along three dimensions: in the x-axis, the number of tax havens in which bank(s) k (of country i) report foreign affiliates, in the y-axis, abnormal turnover in tax havens estimated for bank(s) k (of country i) defined in Eq.(4) at the bank-level and in Eq.(5) at the

country level; last, the size of the circle is proportionate to the turnover reported by bank(s) k (of country i) in tax havens.

Figure 3: Abnormal activity by country of origin



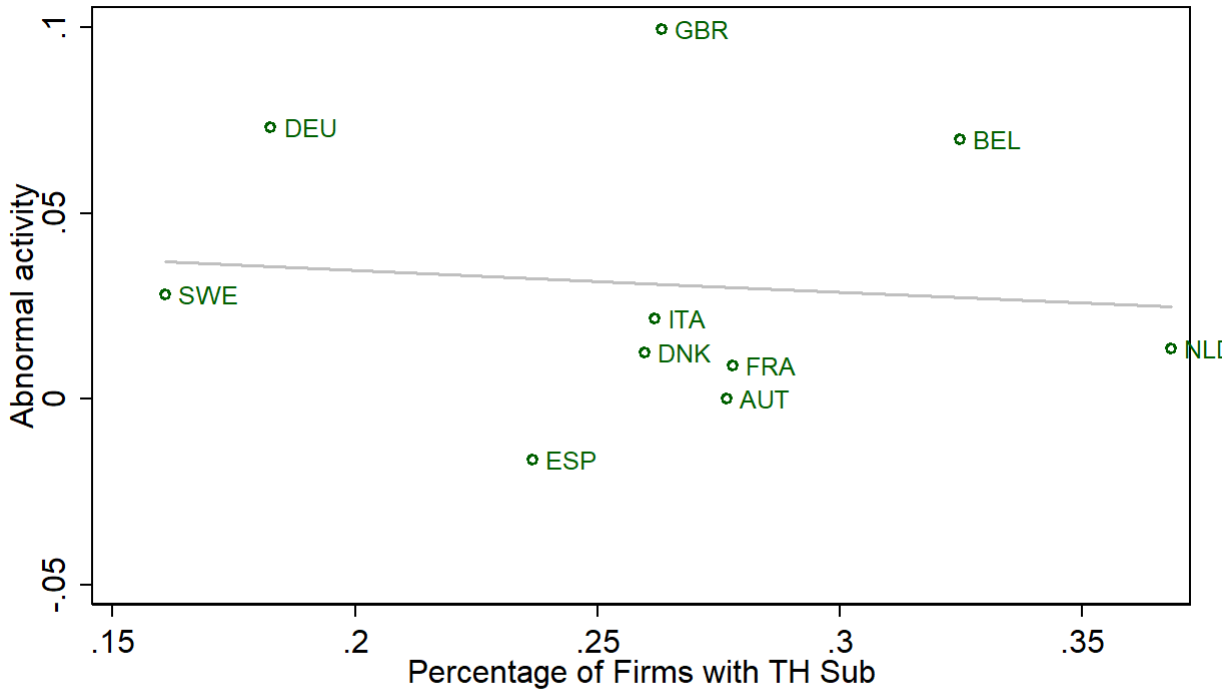
Note: Y-axis: Abnormal activity is the sum of abnormal turnover recorded by banks k of origin country i in tax havens as a ratio of total turnover (domestic+foreign) of these banks.
X-axis: Average number of tax haven jurisdictions where banks k of origin country i reports foreign affiliates. The size of the circle is proportionate to the total turnover recorded by banks k of origin country i in tax havens. The reference list of tax havens is Hines and Rice (1994).

Our model detects null or negative abnormal activity in tax havens for the Austrian bank and Spanish banks of our sample. In turn, we observe a group of countries in the middle horizontal band where abnormal activity represents less than 3% of their global activity (Denmark, Sweden, Italy, the Netherlands and France). It is worth observing that the French banks, which have a strong foreign commercial presence in general, report a widespread presence in tax havens also, yet with a quasi-null abnormal activity (0.9% of their global activity). In comparison, two British banks and two German banks are particularly aggressive: Standard Chartered and HSBC have abnormal activity in havens equal to 21% and 17% of their global activity while DZBank and Deutsche Bank'

abnormal activity in havens represents 15% and 8% of their global activity. Overall, the aggregate abnormal activity of German and British banks represent 7.3% and 10% of their global activity, while it represents 1.7% for the other banks.

5.3 Comparison with Previous Studies

Figure 4: Abnormal banking activity and multinational presence in tax havens



Note: Y-axis: Abnormal activity is the sum of abnormal turnover in tax havens recorded by banks k of origin country i as a ratio of total turnover (domestic+foreign) of these banks.
X-axis: percentage of publicly listed firms that have at least one tax haven subsidiary (from Bennedsen and Zeume (2018)).

Does the unexplained banking activity in tax havens mirror what we already know about tax evasion geography? To answer, we draw from previous empirical works that have documented tax evasion geography using different sources. On the one hand, Figure 4 plots a scatter between our measure of abnormal banking activity by country of origin and the data about the havens presence of MNE taken from Bennedsen and Zeume (2018). More precisely, we examine the relationship between abnormal banking activity in tax havens by country of origin and the percentage of publicly

listed firms from the same countries that have at least one tax haven subsidiary.[19] There is no clear graphical pattern between the two variables and, in fact, no statistical prediction power ($R^2 = 0.9\%$).

On the other hand, Figure 5 plots a scatter between our measure of abnormal banking activity and data about offshore households' wealth taken from Alstadsæter et al. (2017). In this case, the larger the offshore wealth (as a percentage of GDP) the larger the abnormal banking activity.[20] How can it be? The first straightforward explanation might be that MNEs do not use the banking services of foreign affiliates of home banks. In sum, the foreign affiliate of a French MNE located in Luxembourg uses non French banks (Luxembourgean or any other nationality). We know from the corporate finance literature that foreign affiliates of MNE access local financial markets but to the best of our knowledge there is no systematic evidence on the nationality of the banks used on the local market. For example, the US Senate report on Caterpillars offshore tax strategy documents that Caterpillar's Swiss affiliate based in Geneva obtain financing from a private bank but we have no information on the nationality of the bank. In sum, ta large difference between the nationality of MNE and of the bank(s) they use may explain why the havens presence of MNE does not match the havens presence of banks of the same nationality. In addition, corporate evasion schemes involve the creation of various legal entities in several jurisdictions in a long and complex geographic evasion chain. The "Dutch sandwich" illustrates this complexity as it refers to the conduit role of the Netherlands in facilitating movements to tax havens through provisions which allow money to be funnelled out of EU countries to tax havens such as the Caymans Island and the Bermuda. It is not clear where the intermediation fees are covered and if they are by the headquarter or the foreign affiliates.

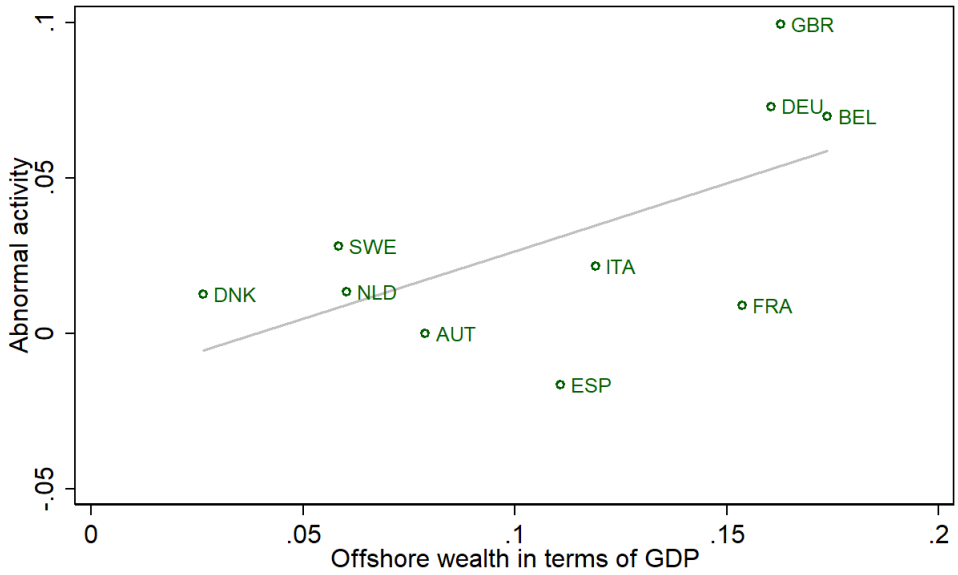
On the other hand, household evasion schemes also involve the creation of various legal entities such as corporations, trust or foundation but anecdotal evidence suggest that the geographic chain is shorter (Levin and Coleman, 2008). Moreover household offshore wealth is probably more sticky than corporate shifted profits. In sum, with important caveat in mind, due to various data sources and different countries coverage, we observe that CbCR data offer an interesting window to wealthy

[19] Bennedsen and Zeume (2018) collect subsidiary data from Dun and Bradstreets Who Owns Whom 2013/2014 book series. Our list of tax havens is more restricted than theirs so we match their list to ours.

[20] Alstadsæter et al. (2017) use the country share of banking deposit as recorded by the BIS. Therefore they use banking data (deposit) as we do (turnover), a fact that might artificially drive the similitude. However, while we have the same list of countries of origin, their list of tax havens is significantly different from ours (shorter and including different jursidictions), a fact that mitigates the similitude due to composition effect.

individual evasion and might be less informative for corporate evasion.

Figure 5: Abnormal banking activity and household offshore wealth



Note: Y-axis: Abnormal activity is the sum of abnormal turnover in tax havens recorded by banks k of origin country i as a ratio of total turnover (domestic+foreign) of these banks.
X-axis: Offshore wealth in terms of GDP (from Zucman et al. (2017)).

5.4 Impact of CbCR on Geographical Location

CbCR requirement was part of a policy agenda enhancing transparency to preclude aggressive tax planning and profit shifting. Johannesen and Stolper (2017) and O'Donovan et al. (2017) have examined the impact of data leaks (LGT Bank in Liechtenstein and Panama Papers) on the market value of the firms involved. They show that these scandals caused a sharp decrease. These findings suggest that information about tax havens is valued by investors, and so companies probably care. Therefore, a natural question is whether the implementation of CbCR had any impact on banks commercial presence in tax havens. To answer, we use the 2016 data over the same sample of banks. Descriptive statistics reveal that data are very similar over the two years. At the bank level, 2015 turnover predicts 2016 turnover with an $R^2 = 0.99\%$. The turnover reported in tax havens is 22.4% and 22.3% of total turnover in 2015 and 2016 respectively. To be sure, we test whether the estimated model has changed in 2016. We assume that if CbCR requirement has had

any effect on banks commercial presence, we will find a different estimated coefficient on the tax haven dummy the second year, as well as possible changes in other coefficients. We thus run a test with a flavour of a difference-in-difference method by interacting a dummy equal to 1 in 2016 and 0 in 2015 with all variables of Eq. 1 including bank fixed effects. Table 4 confirms that none estimated coefficients of interactions with the 2016 dummy are significant. We conclude that the model is not significantly different in 2016, suggesting that the transparency policy has not (yet) modified banks behaviour. Obviously, we cannot observe its impact precisely at its introduction by comparing behaviours before and after its enforcement. However, the CBCR requirements were a last minute extension of CRD IV adopted in July 2013 with first published data concerning the 2015 year. The one and half year process suggests that banks location decisions can have changed only marginally before the requirement was enforced.

5.5 Banks contribution to tax evasion intermediation

What is the banks' contribution to tax evasion intermediation? As already noted, banks are part of a chain of financial intermediaries between tax evaders and tax havens including also mutual funds, funds of funds, insurance companies, etc. We would like to assess the relative role banks play in this intermediating chain. We noted that our data are probably not informative on corporate tax evasion. So in the following we focus on individual offshore wealth.

From turnover (income) amounts, we can get an approximate idea of corresponding offshore deposit by using the income to deposit ratio. More precisely, we sum up the residuals of Eq.1 for all country j listed as a tax haven, which yields the euros amount of unexplained banking activity in tax havens of all banks in our sample. We apply the income to deposit ratios collected from World Bank GFD database to this euros amount to get the corresponding amount of offshore deposits. In total we estimate that the banks in our sample contribute to intermediating a total of €549.2 billion offshore deposits, i.e. 4.9% of the 8 contributing countries GDP (see Table 5).

Our estimate most likely is a lower bound because a part of fees and commission for tax evasion facilitating services earned by banks is likely to be recorded domestically. In addition, households hold their offshore wealth in the form of securities as much as deposits. Unfortunately we have no data about the proportion of offshore wealth held as securities compared to as deposits. In comparison, Alstadsæter et al. (2017) estimate that the offshore wealth of individuals from Continental

Table 4: Changes in the commercial presence in tax havens in 2016

Dependent variable:	$Turnover_{k,i,j}$		$Turnover_{k,i,j}$		$Turnover_{k,i,j}$	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$\log(GDPCAP_j)$	1.1413***	(0.0826)	1.1643***	(0.1181)	1.1542***	(0.1240)
$\log(Pop_j)$	0.7322***	(0.0549)	0.7872***	(0.0803)	0.7862***	(0.0811)
$\log(dist_{i,j})$	-5.1288***	(0.5368)	-5.1602***	(0.7162)	-5.2433***	(0.7623)
$\log(dist_{i,j})^2$	0.3131***	(0.0356)	0.3138***	(0.0476)	0.3190***	(0.0505)
$Euro_{i,j}$	0.7969***	(0.1922)	0.7235***	(0.2450)	0.7565***	(0.2646)
$Contig_{i,j}$	0.2267	(0.1975)	0.2236	(0.2650)	0.2347	(0.2715)
$Lang_{i,j}$	0.6801***	(0.1578)	0.6491***	(0.2158)	0.6181***	(0.2225)
$Colony_{i,j}$	1.0703***	(0.1872)	1.1329***	(0.2370)	1.1321***	(0.2596)
$RTA_{i,j}$	0.6714***	(0.2144)	0.7437**	(0.2889)	0.7510**	(0.2974)
$Territory_{i,j}$	0.3055	(0.3694)	0.2345	(0.5033)	0.2197	(0.5036)
GFC_j^{Dum}	-1.5222***	(0.2600)	-1.4893***	(0.3468)	-1.5050***	(0.3541)
GFC_j^{Rating}	2.2518***	(0.3856)	2.0224***	(0.5179)	2.0587***	(0.5407)
TH_j^{Hines}	0.9494***	(0.3247)	1.1046***	(0.3600)	1.1073***	(0.3591)
$TH_j^{Hines} \times d_t^{2016}$	-0.0379	(0.4303)	-0.3297	(0.5101)	-0.3303	(0.5083)
$\log(GDPCAP_j) \times d_t^{2016}$			-0.0322	(0.1519)	-0.0123	(0.1667)
$\log(Pop_j) \times d_t^{2016}$			-0.1042	(0.1070)	-0.1019	(0.1092)
$\log(dist_{i,j}) \times d_t^{2016}$			0.0066	(0.9592)	0.1653	(1.0775)
$\log(dist_{i,j})^2 \times d_t^{2016}$			0.0031	(0.0645)	-0.0070	(0.0716)
$Euro_{i,j} \times d_t^{2016}$			0.1471	(0.3261)	0.0852	(0.3837)
$Contig_{i,j} \times d_t^{2016}$			0.0152	(0.3705)	-0.0088	(0.3937)
$Lang_{i,j} \times d_t^{2016}$			0.0624	(0.3014)	0.1210	(0.3158)
$Colony_{i,j} \times d_t^{2016}$			-0.1382	(0.3156)	-0.1276	(0.3755)
$RTA_{i,j} \times d_t^{2016}$			-0.1225	(0.4151)	-0.1353	(0.4311)
$Territory_{i,j} \times d_t^{2016}$			0.2029	(0.7398)	0.2282	(0.7402)
$GFC_j^{Dum} \times d_t^{2016}$			-0.1026	(0.4956)	-0.0694	(0.5227)
$GFC_j^{Rating} \times d_t^{2016}$			0.4951	(0.7139)	0.4203	(0.7683)
No. obs.	16798		16798		16798	
No. positive obs.	1841		1841		1841	
bank FE	yes		yes		no	
time FE	yes		yes		no	
bank-and-time FE	no		no		yes	
Log Likelihood	-650000		-648301		-646353	
BIC	1300506		1297224		1293679	
R2	0.34		0.34		0.34	
pseudo-R2	0.69		0.69		0.69	

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Heteroskedasticity robust standard errors (using Huber/White/sandwich estimator of variance) are in brackets. Variable d_t^{2016} is a dummy variable equal to 1 in 2016 and 0 otherwise.

Table 5: Offshore deposits intermediated by banks

Country of origin	Unexplained Income in tax haven	Offshore deposits	as % of GDP
GBR	15,874.5	359,966	13.8%
DEU	4,202.3	95,289	3.1%
BEL	430.7	9,767	2.4%
SWE	780.2	17,692	3.9%
ITA	1,090.2	24,722	1.5%
NLD	518.3	11,752	1.7%
DNK	136.1	3,086	1.1%
FRA	1,187.5	26,928	1.2%
Total	22,704.9	549,202	4.9%

Note: We collect the income to deposit ratio of all tax haven jurisdictions covered by the World Bank from the GFDD database. We calculate the average ratio (4.41%). We sum the abnormal turnover of the 8 countries of origin displaying a positive abnormal actvity) and we multiply it by the income to deposit ratio to obtain offshore deposits. (Average are calculated on all tax havens listed by Hines and Rice (1994) except Anguilla, British Virgin Islands, Channel Islands, Gibraltar, Montserrat, Curacao, Sint Maarten, Saint Kitts and Nevis, Saint Martin, Turks and Caicos Islands.) Data: CbCR (2015). Source: Authors.

Europe represents 15% of the countries GDP. Our estimates are not directly comparable as they consider offshore securities while we consider deposit holdings.

Now, there is a strong heterogeneity among countries with British banks contributing more largely to intermediating tax evasion than the banks in other countries (offshore deposits intermediated by British banks represent 13.8% of the UK GDP). Obviously global banks have international clients, implying that the activity of a British bank does not reflect tax evasion by British clients only. A part of tax evasion intermediated by British banks most likely belongs to other nationalities.

6 Implications for the Policy Agenda

Our empirical results have important policy implications. First, we uncover that banks are a substantial intermediate in individuals tax evasion. Second, our finding of no significant change after the enforcement of the CbCR requirements suggests that transparency alone does not create enough incentives. Third, our results suggest that tax avoidance agenda needs acting granular. In fact, only

a few banks in our sample have a substantial abnormal activity in tax havens.[21] A sensible policy agenda should therefore not be limited to transparency but also include measures targeted to banks with substantial abnormal activity in tax havens. In order to not making banking regulation more complex, one could imagine using existing Supervisory Review and Evaluation Process (SREP) to address tax avoidance intermediation business. More precisely, the first component of the SREP is the Business Model Analysis (BMA) that assesses the viability and sustainability of the business model. Including the responsibility and accountability of the business model in the BMA framework would be quickly operable and would give the ability to banking supervisors to address the issues related to the excessive presence of a bank in tax havens. Fourth, our results unambiguously emphasize the central role of Luxembourg in tax evasion intermediated by banks. Not only the abnormal activity of banks is substantial, but almost all banks of our sample report activity in Luxembourg. In other words, Luxembourg's contribution to tax evasion is a pan-European issue that needs a collective answer. This is obviously at odds with the European Union's decision to exclude Luxembourg from their blacklisting in December 2017.[22]

Some policy comments derive from our manipulating the CbCR data. It is possible to improve the diffusion of data, without significant costs. For now, the data need to be manually and separately collected and for each bank. The data are usually provided within the financial reports, not readily available, and with notable differences across banks. Several recommendations of the International Open Data Charter could be applied.[23] The data need to be provided in open, multiple, and standardized formats, so that it can more easily be processed and used by a wide range of parties (scholars, journalists, NGOs,). Once standardized, the data need to be published on a central portal managed by the European Central Bank or the European Banking Authority. Additional information reporting could be reported without additional costs: the number and the names of affiliates, total asset and more generally some aggregate items of the balance sheet to better reflect affiliates underlying activity.

Last but not least, after collecting the data, we noticed a very light commercial presence of

[21] Our finding that British banks play a substantial role takes a special importance in the context of Brexit and the negotiations about the European passports for British financial institutions Delatte and Toubal (2017).

[22] In December 2017, the Council of the EU released a list of non-cooperative jurisdictions. The listing has been widely criticized notably for excluding EU's allegedly important tax havens.

[23] In July 2013, G8 leaders signed the G8 Open Data Charter, which outlined a set of core open data principles. See http://opendatacharter.net/

the largest European banks in the most prevalent tax havens such as Panama, the Bahamas or the Cayman Islands. For example, only one bank reports activity in Panama (Santander) and two in the Bahamas (Société Générale and Santander). Seven banks report activity in the Cayman Islands, between 0.02 and 0.4% of their foreign activity. In contrast, an online investigation reveals that every single of the 10 largest bank of our sample had at least one establishment in one of the aforementioned tax havens in 2015, yet not reported in the CbCR data. In most cases the number of establishment is much larger. For example, we found more than 50 subsidies of Barclays in Cayman Islands, two in Panama and five in Bahamas while the bank does not report any activity in these countries in its annual report (Appendix Data Consistency presents the details). While the data from the CbCR are comprehensive and reliable, there is still a room for interpretation. In particular, Article 89.1 requires information to be disclosed on a consolidated basis but there is no indication as to which level the consolidation should take place. It is likely that banks have to refer to the Capital Requirements Regulation (CRR) Article 18 (methods for prudential consolidation), but a wide range of interpretations are possible. Therefore, while the CbCR seeks to achieve a consolidation at the country-level, we cannot rule out certain consolidation over several countries. Moreover, Article 89.1 requires each institution to disclose annually, specifying by Member State and by third country in which it has an establishment. But, the notion of establishment might be vague for some entities like trusts, partnership, SPVs, etc.

7 Conclusion

The main contribution of this paper is to explore the geography of banking: this is the first paper to take advantage of the CbCR data set which offers a comprehensive and reliable coverage of bank location choices. Overall, our results uncover that tax havens attract extra banking activity beyond regular gravity factors. A few havens concentrate the bulk of banking activity and only a few banks have a substantial abnormal activity in tax havens, two results that suggest granular anti-tax avoidance policy. CbCR requirements has not changed banks commercial presence in tax havens after it was introduced.

This new data set raises subsequent research avenues. First, the CbCR under CRD IV also

applies to investment firms, i.e. mainly broker dealers and asset management entities. A natural continuation is to focus on these entities much less documented. Second, only 2015 data are so far available. There is no requirement to report prior year comparative figures, but in the future we shall be able to examine changes in banking locations by exploiting exogenous changes of environment. Last, the CbCR has first been applied to financial institutions, but there are currently strong pressures in Europe and the US to impose the CbCR to all large MNEs. Such extension would constitute a highly valuable source in corporate finance research.

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Appendix

Data

The country-by-country reporting

Recital (52) of CRD clearly presents the motivations behind the CbCR[24]:

- "CBCR will help stakeholders to get a better understanding of groups' structures, their activities and geographical presence. In addition CBCR should help understanding of whether taxes are being paid where the actual business activity takes place. Disclosure and transparency are seen as key regulatory tools which help to ensure that firms effectively implement their obligations and are accountable for the business strategies which they adopt."

- "The new CBCR obligations must be seen against the background of the recent financial crisis, in which unprecedented levels of public support were necessary in order to restore financial stability and the trust of citizens in the financial sector was heavily affected. This led to strong demands for banks to show greater accountability and increased transparency in their relations with the public."

- "Independently from the financial crisis, there are increasing calls on companies to take responsibility for their impact on society and the contribution that businesses make in the form of taxation is increasingly seen as part of corporate social responsibility. This has increased demand for more transparency in the tax affairs of large enterprises in particular where they have significant cross-border activities."

List of tax havens

The list of tax havens is derived from Hines and Rice (1994): Andorra, Anguilla, Antigua and Barbuda, Bahamas, Bahrain, Barbados, Belize, Bermuda, British Virgin Islands, Cayman Islands, Channel Islands (Jersey, Guernsey), Cook Islands, Cyprus, Dominica, Gibraltar, Grenada, Hong Kong*, Ireland*, Isle of Man, Jordan*, Lebanon*, Liberia*, Liechtenstein, Luxembourg, Macao, Maldives, Malta, Marshall Islands, Monaco, Montserrat, Netherlands Antilles (Aruba, Curaao, Sint Maarten), Panama*, Saint Kitts and Nevis, Saint Lucia, Saint Martin, Saint Vincent and the Grenadines, Singapore*, Switzerland*, Turks and Caicos Islands, Vanuatu.

Note: * Population $>$ 2 million.

[24] See also http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52014DC0676.

Descriptive statistics

Table A: Descriptive statistics at the bank level: Turnover

Bank name	Country of origin	No. of destinations	Foreign turnover (in EUR million)			Domestic turnover (in EUR million)
			Total	Mean	Max	
ABN AMRO	NLD	15	1630	108	332	6896
BBVA	ESP	21	16563	788	6983	6785
BFA	ESP	2	128	64	128	5155
BNPP	FRA	64	28633	454	4950	14305
BPCE	FRA	60	4746	86	2548	19118
Banka Montei	ITA	7	125	20	53	4974
Banque Postale	FRA	1	1	1	1	5744
Barclays	GBR	37	19240	520	8488	21090
Bayern LB	DEU	5	223	55	128	2050
CA	FRA	43	8710	212	2790	9021
Caixa Bank	ESP	3	16	8	9	12666
Commerzbank	DEU	10	2983	298	1086	8082
Crédit Mutuel	FRA	17	2783	198	1203	13535
DZ Bank	DEU	19	1732	91	791	5738
Danske Bank	DNK	14	3383	260	1007	7404
Deutsche Bank	DEU	57	18167	349	6307	10510
ERSTE Group	AUT	6	3677	612	1409	2838
Handelsbanken	SWE	17	1624	101	577	2779
HSBC	GBR	58	44613	782	14079	13602
Helaba	DEU	5	237	59	109	1879
ING	NLD	36	11660	364	3123	5185
Intesa Sao	ITA	29	4331	149	780	19323
KBC	BEL	18	2861	178	1197	3286
LBBW	DEU	7	187	26	91	2636
Lloyds	GBR	7	599	85	128	21780
Nationwide	GBR	3	31	15	36	4226
Nord LB	DEU	5	385	77	110	2491
Nordea	SWE	16	7934	495	2605	2893
RBS	GBR	47	2645	61	763	15161
Rabobank	NLD	39	4141	115	1461	8873
SEB	SWE	20	3449	172	604	4838
Société Générale	FRA	79	13546	199	1710	12097
Sabadell	ESP	2	765	382	617	4653
Santander	ESP	35	40344	1152	11720	5551
Standard Chartered	GBR	61	13347	238	2774	2736
Swedbank	SWE	5	982	196	353	3107
Unicredit	ITA	32	12076	503	3452	9252
All banks		902	278503	331	14079	302264
All banks in tax havens		194	48544	265	14079	

Source : Banks' annual reports 2015, Country-by-country reporting (CbCR).

Table B: Descriptive statistics at the bank level: Employees

Bank name	Country of origin	No. of destinations	Foreign employees			Domestic employees
			Total	Mean	Max	
ABN AMRO	NLD	15	4028	268	966	18112
BBVA	ESP	21	103459	4926	38499	32903
BFA	ESP	2	n.a.	n.a.	n.a.	13558
BNPP	FRA	64	124570	2009	17973	56981
BPCE	FRA	60	11655	201	2796	91232
Banka Montei	ITA	7	510	502	302	25201
Banque Postale	FRA	1	n.a.	n.a.	n.a.	4321
Barclays	GBR	37	80713	2181	31221	48622
Bayern LB	DEU	5	233	46	89	6223
CA	FRA	43	33936	870	10348	37559
Caixa Bank	ESP	3	42	14	17	29854
Commerzbank	DEU	10	9382	938	6251	33925
Crédit Mutuel	FRA	17	12972	864	7071	65828
DZ Bank	DEU	19	3178	227	1153	25123
Danske Bank	DNK	14	8951	639	2021	10098
Deutsche Bank	DEU	57	55348	1006	11368	45757
ERSTE Group	AUT	6	n.a.	n.a.	n.a.	n.a.
Handelsbanken	SWE	17	4483	407	1904	7263
HSBC	GBR	58	214358	3760	33062	44559
Helaba	DEU	5	276	55	103	5460
ING	NLD	36	38134	1121	9645	14586
Intesa Sao	ITA	29	27158	969	5035	61243
KBC	BEL	18	16387	1024	7556	10646
LBBW	DEU	7	253	36	71	9748
Lloyds	GBR	7	1101	157	316	87652
Nationwide	GBR	3	83	41	60	16117
Nord LB	DEU	5	443	88	208	5580
Nordea	SWE	16	22724	1420	8288	6957
RBS	GBR	47	27272	634	14567	64567
Rabobank	NLD	39	11915	313	3989	35041
SEB	SWE	20	n.a.	n.a.	n.a.	n.a.
Société Générale	FRA	79	80104	1232	16005	51612
Sabadell	ESP	2	7997	3998	7344	16796
Santander	ESP	35	154329	4676	44957	29838
Standard Chartered	GBR	61	85465	1499	19731	1853
Swedbank	SWE	5	5989	1197	2303	7789
Unicredit	ITA	32	72869	3168	17653	47865
All banks		902	1220317	1512	44957	1070469
All banks in tax havens		194	104202	672	29664	

Source : Banks' annual reports 2015, Country by country reporting (CbCR).

Table C displays country summary statistics. We extend the number of destination countries to 228 in order to account for the absence of activity. The small tax havens correspond to counties of less than 2 million people. The small tax havens represent 0.1% of our sample in terms of population and 0.3% in terms of GDP while big tax havens represent 0.7% of the population sample and 1.7% of the GDP. As stated by Dharmapala and Hines (2009), tax havens experienced high level of income per capita (more than twice higher than the rest of the world). Unsurprisingly, the implicit tax rate is much lower in tax havens, 5% versus 17%, and the financial infrastructures are more developed (measured by the GFSI Index).

Table C: Countries summary statistics

		Non havens	Small havens	Big havens
Nb. countries		185	35	8
GDP (PPP, EUR bn)	Total	112,000	308	1,880
	Av.	605	9	235
	Percent.	98.1%	0.3%	1.6%
Pop. (thousand)	Total	7,260,000	6,942	48,500
	Av.	39,300	198	6,064
	Percent.	99.2%	0.1%	0.7%
GDP/capita (EUR)	Total	15,427	44,369	38,763
	Av.	17,786	36,643	38,763
Implicit Tax Rate		17%	5%	5%
Financial infrastructures		54	67	68

Source : CbCR (2015). Sample : The 37 largest European banks. The sample includes only countries where European banks declare subsidiaries. Effective tax rate is taken from the Bureau of Economic Analysis. Financial Infrastructure development is measured with the GFSI Index from Z/Yen Group.

Definitions and sources of the variables

We use a standard gravity specification on banks' foreign presence to estimate the *natural* presence of banks in the different locations.

$$\begin{aligned} Y_{k,i,j} &= \exp(\alpha_k + \beta_1 \log(GDPCAP_j) + \beta_2 \log(Pop_j) + \beta_3 \log(dist_{i,j}) + \beta_4 Contig_{i,j} \\ &\quad + \beta_5 Lang_{i,j} + \beta_6 Colony_{i,j} + \beta_7 RTA_{i,j} + \beta_8 Territory_{i,j} + \beta_9 GFC_j^{Dum} \\ &\quad + \beta_{10} GFC_j^{Rating}) + \varepsilon_{k,i,j} \end{aligned}$$

- $GDPCAP_j$ and j (Pop_j): GDP per capita and population in country j are collected from the World Factbook database provided by the Central Intelligence Agency (CIA). The World Factbook database is cross-sectional but covers a larger number of countries (i.e. sovereign states and dependent territories) than other databases as the one provided by the United Nations Statistics Division.

- $dist_{i,j}$, $Contig_{i,j}$, $Lang_{i,j}$, $Colony_{i,j}$: geographical distance, presence of a common border, a common language, a colonial relationship, are collected from the CEPII distance database.

- $RTA_{i,j}$: the signature of a regional trade agreement, comes from de Sousa (2012) updated by the author (http://jdesousa.univ.free.fr/data.htm). Their database covers 199 countries over the time period 1958-2015. In order to fill the gap up to 228 countries, we use the RTA database provided by the World Trade Organization (WTO).

- $Territory_{i,j}$: country j is a dependent territory of country i The variable is computed by the authors after Claessens and Horen (2014).

- GFC_j^{Dum}, GFC_j^{Rating}: country j has a city classified as a Global Financial Center, the rating of the GFCI index. Source: Global Financial Centres Index (GFCI) computed by the Z/Yen Group that provides profiles, ratings and rankings for financial centres. We identify countries that have a financial centre classified as global in the GFCI #17 and #18 (March and Sept. 2015). These global financial centres can be "broad & deep", "relatively broad" or "relatively deep". 16 countries have a global financial centre: Belgium, Canada, China, Hong Kong, France, Germany, Ireland, Japan, Luxembourg, the Netherlands, Republic of Korea, Singapore, Switzerland, United Arab Emirates, the United Kingdom, and the United States of America.

- TH_j^{Hines}: country j is listed as a tax havens by Hines and Rice (1994). For the sake of robustness we alternatively consider TH_j^{Count} a count variable equal to the number lists of tax havens on which country j is recorded (out of 11 lists mentioned in Palan et al. (2013)); TH_j^{Top15} a dummy variable equal to 1 if country j is ranked in the top 15 of tax havens defined by Oxfam and 0 otherwise.

Estimators: PPML and alternatives

Our large sample includes 228 countries including a lot of null values of the dependent variable, turnover or number of employees. To address this statistical issue, we rely on the Poisson pseudo-maximum likelihood (PPML) estimator. In fact the PPML estimator has three main advantages to estimate a gravity model.

- First, the PPML estimator does not require a log-linear specification of the gravity model. Consequently, the PPML estimator is consistent in the presence of heteroskedasticity, while estimators requiring a log-linear specification, as the OLS estimator, can be biased and inconsistent (Santos Silva and Tenreyro (2006)). More specifically, heteroskedasticity would result from the log transformation of the original nonlinear gravity model. Consequently, this kind of heteroskedasticity does not only affect OLS standard errors but also OLS parameter estimates. Alternatively, the PPML estimator provides consistent estimates of the original nonlinear gravity model.

- Second, the PPML estimator provides a natural way to deal with zero values of the dependent variable. This is the case because it assumes that the zero and non-zero observations are produced by the same data generating process. Last, note that the PPML estimator is consistent, as a PML estimator, even if the data are not Poisson-distributed. In other words, no observation is dropped to estimate the model and PPML estimates are not exposed to a sample selection bias. Conversely, OLS estimates, using log transformation of the dependent variable, imply dropping the zero observations and are particularly exposed to a sample selection bias. A simple strategy to deal with the zero observations might be to arbitrarily add a small positive number (usually 0.5 or 1) to all observations but such ad-hoc approach might perform poorly.

- Last, interpretation of estimated coefficients is straightforward; estimated coefficients are interpreted as elasticities for covariates entered in logarithms and as semi-elasticities for covariates entered in levels. Note that estimated coefficients associated with dummy variables (as TH_j^{Hines} for instance) are not directly interpreted. The percentage change of the dependent variable when a dummy variable moves from 0 to 1 is given by $exp(\hat{\beta}) - 1$, where $\hat{\beta}$ is the estimated coefficients associated with dummy variable.

For robustness check, we also consider the Negative Binomial Quasi-Generalised Pseudo-Maximum Likelihood estimator (NB QGPML) as suggested by Bosquet and Boulhol (2014). It is scale invariant, contrary to standard NB QGPML estimators, implying that it can be applied to a continuous dependent variable (for which unit choice is arbitrary by definition). This estimator is an alternative to the PPML estimator. In fact, the PPML estimator assumes proportionality between the conditional variance and the conditional expectation of the dependent variable. In turn, the NB QGPML estimator encompasses the Poisson assumption as a special case and might be more efficient when the dependent variable exhibit over-dispersion (i.e., the conditional variance of the dependent variable increases more than proportionally with the conditional mean).

Robustness

We have tested various alternatives to test the robustness of our results.

1. *Small sample.* As mentioned in the descriptive statistics, the 37 banks are present in 138 countries in total. The lack of presence in a jurisdiction is an important information that we have accounted for by completing the panel with zeros. Table D presents the results of the baseline specifications estimated on a small sample including only the 138 countries. Estimates on the small sample confirm results.

Table D: Baseline specifications (Small sample, PPML Estimator)

Dependent variable:	$Turnover_{k,i,j}$		$Turnover_{k,i,j}$		$Employees_{k,i,j}$		$Employees_{k,i,j}$	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$\log(GDPCAP_j)$	1.0365***	(0.1461)	1.0947***	(0.1478)	0.8445***	(0.1217)	0.8673***	(0.1261)
$\log(Pop_j)$	0.5535***	(0.1003)	0.7013***	(0.0863)	0.8063***	(0.0763)	0.8720***	(0.0612)
$\log(dist_{i,j})$	-4.5085***	(0.6583)	-4.9912***	(0.7467)	-4.0050***	(0.9495)	-4.4430***	(1.0081)
$\log(dist_{i,j})^2$	0.2756***	(0.0435)	0.3044***	(0.0494)	0.2319***	(0.0625)	0.2588***	(0.0664)
$Euro_{i,j}$	0.5980**	(0.2487)	0.7374***	(0.2579)	0.1581	(0.2715)	0.2980	(0.2835)
$Contig_{i,j}$	0.4832*	(0.2774)	0.3107	(0.2720)	0.3401	(0.2683)	0.1719	(0.2775)
$Lang_{i,j}$	0.6685***	(0.2184)	0.5989***	(0.2217)	0.8366***	(0.2211)	0.7660***	(0.2173)
$Colony_{i,j}$	1.1047***	(0.2715)	1.1344***	(0.2606)	0.9683***	(0.2623)	1.0058***	(0.2537)
$RTA_{i,j}$	0.6598**	(0.2993)	0.7101**	(0.3017)	0.6683**	(0.2800)	0.6887**	(0.2840)
$Territory_{i,j}$	0.0196	(0.5286)	0.0566	(0.4931)	0.3490	(0.5263)	0.0526	(0.5886)
GFC_j^{Dum}	-1.1386***	(0.3142)	-1.4381***	(0.3521)	-1.4700***	(0.3539)	-1.6747***	(0.3747)
GFC_j^{Rating}	2.2433***	(0.5218)	2.2071***	(0.5432)	1.1993**	(0.5318)	1.2701**	(0.5512)
TH_j^{Hines}			0.9279***	(0.3447)			0.7792**	(0.3602)
No. Obs.	5069		5069		4521		4521	
No. Positive Obs.	902		902		873		873	
No. Countries	138		138		138		138	
No. Tax Havens	-		26		-		26	
Log Likelihood	-314388		-307835		-1589283		-1574270	
BIC	629195		616096		3178946		3148926	
R2	0.32		0.34		0.31		0.32	
pseudo-R2	0.65		0.66		0.59		0.60	

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Heteroskedasticity robust standard errors (using Huber/White/sandwich estimator of variance) are in brackets.

2. *Alternative tax haven dummies.* We estimate the specification with two alternative Tax Haven dummies: TH_j^{Count} a count variable equal to the number of lists of tax havens on which country j is recorded. Therefore the estimated coefficient associated with TH_j^{Count} measures the marginal effect of being included in one additional list of tax havens. TH_j^{Top15} a dummy variable equal to 1 if country j is ranked in the top 15 of tax havens defined by Oxfam and

0 otherwise. Table E confirm that the coefficient of both alternatives are significant and positive, and the marginal effect associated with TH_j^{Top15} is similar to the baseline estimate.

Table E: Alternative definitions of tax havens on large and small samples (PPML Estimator)

Dependent variable:	$Turnover_{k,i,j}$		$Turnover_{k,i,j}$		$Turnover_{k,i,j}$		$Turnover_{k,i,j}$	
Sample:	Large		Large		Small		Small	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$\log(GDPCAP_j)$	1.2822***	(0.1270)	1.2557***	(0.1340)	1.0896***	(0.1364)	1.0720***	(0.1433)
$\log(Pop_j)$	0.7491***	(0.0732)	0.7390***	(0.0801)	0.6707***	(0.0758)	0.6641***	(0.0839)
$\log(dist_{i,j})$	-4.8140***	(0.6895)	-4.8475***	(0.7175)	-4.6490***	(0.6864)	-4.6649***	(0.7096)
$\log(dist_{i,j})^2$	0.2910***	(0.0456)	0.2947***	(0.0473)	0.2820***	(0.0453)	0.2843***	(0.0467)
$Euro_{i,j}$	0.5645**	(0.2502)	0.6680***	(0.2540)	0.5794**	(0.2459)	0.6655***	(0.2488)
$Contig_{i,j}$	0.4350	(0.2742)	0.3622	(0.2719)	0.4774*	(0.2747)	0.4131	(0.2717)
$Lang_{i,j}$	0.6560***	(0.2200)	0.6481***	(0.2276)	0.6283***	(0.2198)	0.6215***	(0.2262)
$Colony_{i,j}$	1.1089***	(0.2726)	1.1163***	(0.2635)	1.1163***	(0.2711)	1.1237***	(0.2639)
$RTA_{i,j}$	0.7196**	(0.2991)	0.7293**	(0.2947)	0.6843**	(0.3022)	0.6877**	(0.3007)
$Territory_{i,j}$	-0.1014	(0.5973)	0.4542	(0.4939)	-0.2417	(0.5785)	0.2449	(0.4821)
GFC_j^{Dum}	-1.3783***	(0.3230)	-1.6590***	(0.4327)	-1.3390***	(0.3240)	-1.5700***	(0.4235)
GFC_j^{Rating}	2.0510***	(0.4990)	2.2906***	(0.5899)	2.2099***	(0.5027)	2.3968***	(0.5785)
TH_j^{Count}	0.1774**	(0.0708)			0.1543**	(0.0681)		
TH_j^{Top15}			0.9785**	(0.3958)			0.8362**	(0.3809)
No. Obs.	8399		8399		5069		5069	
No. Positive Obs.	902		902		902		902	
No. Countries	228		228		138		138	
No. Tax Havens	-		43		-		26	
Log Likelihood	-318981		-318228		-308792		-308587	
BIC	638415		636907		618011		617600	
R2	0.33		0.33		0.34		0.33	
pseudo-R2	0.70		0.70		0.66		0.66	

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Heteroskedasticity robust standard errors (using Huber/White/sandwich estimator of variance) are in brackets.

3. *Large tax havens.* We include TH_j^{Large} a dummy equal to 1 if a jurisdiction is a large tax haven (more than 2 million population). This is to account for the distinction made by Hines and Rice (1994) who point that most tax havens are small jurisdictions. Results indicate that the dummy is not significant, a fact suggesting that the effect of tax havens is similar whatever their size.

Table F: Do large tax havens have a different impact?

Dependent variable:	$Turnover_{k,i,j}$		$Turnover_{k,i,j}$	
Sample:	Large		Small	
Estimator:	PPML		PPML	
	Coef.	S.E.	Coef.	S.E.
$\log(GDPCAP_j)$	1.2789***	(0.1448)	1.0944***	(0.1536)
$\log(Pop_j)$	0.7841***	(0.0950)	0.7008***	(0.0985)
$\log(dist_{i,j})$	-5.2480***	(0.7765)	-4.9926***	(0.7591)
$\log(dist_{i,j})^2$	0.3192***	(0.0512)	0.3045***	(0.0500)
$Euro_{i,j}$	0.7644**	(0.3254)	0.7398**	(0.3162)
$Contig_{i,j}$	0.2309	(0.2775)	0.3095	(0.2767)
$Lang_{i,j}$	0.6173***	(0.2238)	0.5987***	(0.2227)
$Colony_{i,j}$	1.1336***	(0.2650)	1.1348***	(0.2651)
$RTA_{i,j}$	0.7470**	(0.3065)	0.7088**	(0.3107)
$Territory_{i,j}$	0.2393	(0.3876)	0.0623	(0.3817)
GFC_j^{Dum}	-1.5088***	(0.3584)	-1.4391***	(0.3554)
GFC_j^{Rating}	2.0648***	(0.5729)	2.2087***	(0.5703)
TH_j^{Hines}	1.0683**	(0.4216)	0.9165**	(0.4162)
TH_j^{Large}	0.0472	(0.5662)	0.0138	(0.5486)
No. Obs.	8399		5069	
No. Positive Obs.	902		902	
No. Countries	228		138	
No. Tax Havens	-		26	
Log Likelihood	-316962		-307834	
BIC	634384		616103	
R2	0.33		0.34	
pseudo-R2	0.70		0.66	

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Heteroskedasticity robust standard errors (using Huber/White/sandwich estimator of variance) are in brackets.

4. *Alternative estimator.* Results reported in Table G are confirmed on estimates using the alternative Negative Binomial Quasi-Generalised Pseudo-Maximum Likelihood (NB QGPML) estimator.

Table G: Alternative estimator

Dependent variable:	$Turnover_{k,i,j}$		$Turnover_{k,i,j}$	
Sample:	Large		Small	
Estimator:	NB QGPML		NB QGPML	
	Coef.	S.E.	Coef.	S.E.
$\log(GDPCAP_j)$	1.5281***	(0.0881)	1.3111***	(0.0922)
$\log(Pop_j)$	0.8800***	(0.0583)	0.7790***	(0.0630)
$\log(dist_{i,j})$	-6.6167***	(1.0055)	-5.8660***	(0.9514)
$\log(dist_{i,j})^2$	0.3862***	(0.0629)	0.3438***	(0.0596)
$Euro_{i,j}$	0.3863*	(0.2004)	0.3921**	(0.1967)
$Contig_{i,j}$	0.2088	(0.2600)	0.3559	(0.2593)
$Lang_{i,j}$	0.5107**	(0.2091)	0.4770**	(0.2091)
$Colony_{i,j}$	1.5423***	(0.2073)	1.4831***	(0.2107)
$RTA_{i,j}$	0.5911***	(0.1653)	0.5511***	(0.1821)
$Territory_{i,j}$	0.2034	(0.4505)	-0.0025	(0.4332)
GFC_j^{Dum}	-1.7617***	(0.3088)	-1.6487***	(0.3065)
GFC_j^{Rating}	2.5538***	(0.4387)	2.5129***	(0.4280)
TH_j^{Hines}	1.1457***	(0.2296)	0.9588***	(0.2337)
No. Obs.	8399		5069	
No. Positive Obs.	902		902	
No. Countries	228		138	
No. Tax Havens	43		26	
Log Likelihood	-122660		-138283	
BIC	245771		276992	

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Heteroskedasticity robust standard errors (using Huber/White/sandwich estimator of variance) are in brackets.

5. *Alternative standard errors computation.* The Huber/White standard errors allow to get heteroskedasticity-consistent standard errors but assume independence of the observations. First we rely on the "cluster–robust" standard errors to relax the assumption of independence of the observations. More precisely, we alternatively account for intragroup correlation at the country j level, at the country i level and at the bank k level. These alternative standard errors do not modify previous conclusions. Second, we consider the bootstrapped standard errors to get some empirical standard errors. Previous conclusions are not modified.

Table H: Alternative Standard Errors

Dependent variable:	$Turnover_{k,i,j}$					
Type of S.E.:		Huber/White	Cluster (country j level)	Cluster (country i level)	Cluster (bank k level)	Bootstrap
	Coef.	S.E.	S.E.	S.E.	S.E.	S.E.
$\log(GDPCAP_j)$	1.2800	(0.1375)***	(0.1723)***	(0.2942)***	(0.1983)***	(0.1402)***
$\log(Pop_j)$	0.7862	(0.0811)***	(0.0950)***	(0.1052)***	(0.0757)***	(0.0818)***
$\log(dist_{i,j})$	-5.2433	(0.7624)***	(1.0665)***	(0.9058)***	(0.7639)***	(0.9448)***
$\log(dist_{i,j})^2$	0.3190	(0.0505)***	(0.0697)***	(0.0636)***	(0.0542)***	(0.0613)***
$Euro_{i,j}$	0.7565	(0.2646)***	(0.3224)**	(0.4411)*	(0.3183)**	(0.2678)***
$Contig_{i,j}$	0.2347	(0.2715)	(0.3509)	(0.3631)	(0.2867)	(0.2872)
$Lang_{i,j}$	0.6181	(0.2225)***	(0.2412)**	(0.3139)**	(0.2737)**	(0.2637)**
$Colony_{i,j}$	1.1321	(0.2596)***	(0.3017)***	(0.2204)***	(0.2537)***	(0.2878)***
$RTA_{i,j}$	0.7510	(0.2974)**	(0.3002)**	(0.1859)***	(0.2391)***	(0.3077)**
$Territory_{i,j}$	0.2197	(0.5036)	(0.5198)	(0.4945)	(0.4905)	(0.5267)
GFC_j^{Dum}	-1.5050	(0.3541)***	(0.3520)***	(0.3045)***	(0.2779)***	(0.3966)***
GFC_j^{Rating}	2.0587	(0.5407)***	(0.5470)***	(0.3653)***	(0.3601)***	(0.6140)***
TH_j^{Hines}	1.1073	(0.3591)***	(0.4653)**	(0.3585)***	(0.3099)***	(0.3508)***
No. Obs.	8399					
No. Positive Obs.	902					
No. Countries	228					
No. Tax Havens	43					
Log Likelihood	-316969					
BIC	634391					
R2	0.33					
pseudo-R2	0.70					

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively.

6. *Excluding banks with low foreign exposure* A few banks in our sample have a low foreign exposure: Banque Postale, BFA, Caixa Bank, Nationwide and Sabadell. Table I presents the results of our baseline specification run on a sample excluding these banks and confirm our results.

Table I: Baseline excluding Banque Postale and banks with low foreign exposure

Dependent variable:	$Turnover_{k,i,j}$		$Turnover_{k,i,j}$		$Turnover_{k,i,j}$		$Turnover_{k,i,j}$	
Sample:	Large		Large		Small		Small	
Excluded banks:	Banque Postale		Banks with low foreign exposure		Banque Postale		Banks with low foreign exposure	
Estimator:	PPML		PPML		PPML		PPML	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$\log(GDPCAP_j)$	1.2800***	(0.1375)	1.2835***	(0.1380)	1.0947***	(0.1478)	1.0986***	(0.1482)
$\log(Pop_j)$	0.7862***	(0.0811)	0.7882***	(0.0810)	0.7013***	(0.0863)	0.7034***	(0.0863)
$\log(dist_{i,j})$	-5.2434***	(0.7624)	-5.2635***	(0.7611)	-4.9913***	(0.7467)	-5.0116***	(0.7455)
$\log(dist_{i,j})^2$	0.3190***	(0.0505)	0.3204***	(0.0504)	0.3044***	(0.0494)	0.3059***	(0.0493)
$Euro_{i,j}$	0.7565**	(0.2646)	0.7624***	(0.2650)	0.7374***	(0.2579)	0.7433***	(0.2583)
$Contig_{i,j}$	0.2347	(0.2715)	0.2302	(0.2718)	0.3106	(0.2720)	0.3060	(0.2723)
$Lang_{i,j}$	0.6180***	(0.2225)	0.6196***	(0.2221)	0.5989***	(0.2217)	0.6003***	(0.2213)
$Colony_{i,j}$	1.1321***	(0.2596)	1.1370***	(0.2599)	0.1344***	(0.2606)	1.1390***	(0.2608)
$RTA_{i,j}$	0.7510**	(0.2974)	0.7474**	(0.2982)	0.7101**	(0.3017)	0.7067**	(0.3025)
$Territory_{i,j}$	0.2198	(0.5036)	0.1994	(0.5038)	0.0567	(0.4931)	0.0370	(0.4934)
GFC_j^{Dum}	-1.5050***	(0.3541)	-1.4995***	(0.3536)	-1.4380***	(0.3521)	-1.4328***	(0.3516)
GFC_j^{Rating}	2.0586***	(0.5407)	2.0324***	(0.5419)	2.2071***	(0.5432)	2.1808***	(0.5443)
TH_j^{Hines}	1.1073***	(0.3591)	1.1150***	(0.3591)	0.9279***	(0.3447)	0.9358***	(0.3449)
No. Obs.	8172		7264		4932		4384	
No. Positive Obs.	901		891		901		891	
No. Countries	228		228		138		138	
No. Tax Havens	43		43		26		26	
Log Likelihood	-316961		-314723		-307826		-305640	
BIC	634362		629846		616069		611657	
R2	0.33		0.33		0.34		0.33	
pseudo-R2	0.70		0.69		0.66		0.65	

Note: ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. Heteroskedasticity robust standard errors (using Huber/White/sandwich estimator of variance) are in brackets. Banks with low foreign exposure are banks located in less than 5 foreign countries. These banks are Banque Postale, BFA, Caixa Bank, Nationwide and Sabadell.

Data consistency

In continuation of our findings using individual country-by-country reporting by 37 SIB in the EU, we would like to inquire the involvement of the top 10 EU banks in specific tax havens. The principle objective is to investigate the commercial presence of these banks in 5 well-established tax havens, namely Panama, the Cayman Islands, the Bahamas. The list below includes any affiliates, Special Purpose Entities, Trusts etc. listed under these financial institutions in the said locations. We have reported a maximum of 5 names along with the source of the findings. A principle source for our research is the online database compiled 2015 onward by International Consortium of Investigative Journalists (ICIJ) after the offshore entities leaks at Mossack Fonseca (more commonly known as the Panama Papers). The presence of the banks can differ in their capacities. In most cases, their subsidiaries function as intermediaries (a go-between for someone seeking an offshore corporation and an offshore service provider - usually a law-firm or a middleman that asks an offshore service provider to create an offshore firm for a client). For a complete understanding of the various terms you will encounter in the ICIJ Database, please visit this link.

- **BNP Paribas**
  - **Panama**: Banque Paribas (Source: ICIJ)
  - **Cayman Islands**: BNP Paribas Private Bank & Trust Cayman (Source: thebanks.eu); BNP Paribas Fortis (Belgium) (Source: thebanks.eu)
  - **Bahamas**: Paribas Suisse (Bahamas) Ltd. (Source: ICIJ); BNP Paribas Private Bank & Trust Bahamas Ltd (Source: privatebanking.com); BNP Paribas (Bahamas) Limited (Source: bahamaslocal.com); United European Bank and Trust (Nassau) (Source: group.bnpparibas)
- **Group BPCE**
  - **Cayman Islands**: Natixis (Source: thebanks.eu)
  - **Bahamas**: Templier Caisse S.A. (Linked to Caisse d'Epargne, subsidiary of Group BPCE) (Source: ICIJ)
- **Barclays**
  - **Panama**: Banco de Latinoamerica, S.A. (Bancolat) (Source: Panama Investment and Business Guide (Page 278, Vol. 1, 2015 Ed.)); Provesa Finance SA (Source: ICIJ)
  - **Cayman Islands**: Barclays Banks PLC (Source: thebanks.eu); *List of 55 subsidiaries (as of December 31st, 2005)* (Source: sec.gov)
  - **Bahamas**: First Caribbean International (Bahamas) Nominees Company Limited (Source: sec.gov); BBSA (Bahamas) Limited (Source: sec.gov); First Caribbean International Bank (Bahamas) Limited (Source: sec.gov); First Caribbean International Finance Corporation (Bahamas) Limited (Source: sec.gov); Perpetual Nominees S.A. (Source: sec.gov)

- **Credit Agricole** (Note by Credit Agricole after the Panama Papers leaks. Yet, presence in 2015 remains pervasive. (Source: Le Monde))
  - **Panama**: Credit Agricole (Suisse) S.A. *(Intermediary for 65 global entities)* (Source: ICIJ); NWT Conseil S.A. (Linked to Credit Agricole) (Sources: easymonitoring.ch,ICIJ)
  - **Cayman Islands**: Credit Agricole Corporate and Investment Bank (Source: thebanks.eu)
  - **Bahamas**: Credit Agricole Suisse (Bahamas) Ltd (Source: bahamaslocal.com); Credit Agricole Management Service (Bahamas) (Source: ICIJ)
- **Deutsche Bank**
  - **Panama**: Nescoll Ltd. (Source: sueddeutsche.de); Nielsen Ltd. (Source: sueddeutsche.de)
  - **Cayman Islands**: Deutsche Bank (Cayman) Limited *(Note: This branch is the only subsidiary they have officially listed)* (Source: Deutsche Bank); *List of 91 subsidiaries (as of December 31st, 2011)* (Source: sec.gov) (For example DB Jasmine (Cayman) Limited which was closed on 31st March, 2017)
  - **Bahamas**: Deutsche Bank Trust Company Americas (Source: privatebanking.com)
- **HSBC**
  - **Cayman Islands**: HSBC International Trustee(s) Limited (Source: ICIJ); HSBC Trustee (Cayman) Limited; HSBC China Fund Limited; HSBC International Trustee (Cayman) Limited
  - **Bahamas**: *List of 9 subsidiaries (Panama Papers leaks)* (Source: ICIJ); HSBC International Trustee (Bahamas) Ltd. (Source: ICIJ); Hong Kong & Shanghai Banking Corp.
- **Lloyds**
  - **Panama**: Lloyds TSB Bank PLC (Source: privatebanking.com)
  - **Cayman Islands**: Lloyds TSB Bank & Trust (Cayman) Ltd (Source: privatebanking.com)
  - **Bahamas**: Lloyds Bahamas Securities Limited (Source: ICIJ)
- **Royal Bank of Scotland**
  - **Panama**: The Royal Bank of Scotland Trust Company (Jersey) Limited *(Intermediary for 38 global entities)* (Source: ICIJ)
  - **Bahamas**: RBS Securities Limited (Source: ICIJ)
- **Societe Generale**

  - **Panama**: SG Private Banking (Geneva) (Source: Le Monde); Societe Generale des Metaux Occidentaux S.A. (Source: ICIJ); Societe Generale Bank & Trust Luxembourg *(Intermediary for Falco Consultants Inc.)* (Source: ICIJ)
  - **Bahamas**: SG Hambros Bank & Trust (Source: Le Monde)

- **Banco Santander**
  - **Panama**: Santander Business S.A. (Source: ICIJ)
  - **Bahamas**: *List: 9 Subsidiaries (Panama Papers leaks)* (Source: ICIJ); Santander Bank and Trust (Bahamas) Limited *(Intermediary for 559 global entities)* (Source: ICIJ); Banco Santander Trust Banking Corporation (Bahamas) Limited *(Intermediary for 4 global entities)* (Source: ICIJ)